REMARKS

Reconsideration and allowance of this application, as amended, are respectfully requested. The written description and claim 1 have been amended, and claims 3, 11-14, 20, and 21 have been cancelled. New claims 24-30 have been added. Claims 1, 2, 4-10, 15-19, and 22-30 are now pending in the application. The rejections are respectfully submitted to be obviated in view of the amendments and remarks presented herein.

In the present Amendment, the written description has been amended to correct the informalities identified in the Office Action, and claim 1 has been editorially amended in response to the rejection under § 112, second paragraph. Claims 3, 11, 12, 13, 14, 20, and 21 have been cancelled, and have been replaced by new claims 24, 25, 26, 27, 28, 29, and 30, respectively. Entry of each of the amendments is respectfully requested.

35 U.S.C. § 102(b) - Watanabe

Claims 1-23 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 6,333,510 to Watanabe et al. (hereinafter "Watanabe").

The rejection is respectfully traversed. For at least the following reasons, the disclosure of Watanabe does not anticipate Applicants' claimed invention.

First, Watanabe's deflection element 102 is not equivalent to Applicants' claimed aligner, as is asserted at Office Action page 3. As is evident from the attached reference sheet 1, Applicants' claimed aligner aligns the axis with respect to an optical element such as an objective lens or an astigmatism corrector. Watanabe's deflection element 102, however, scans the sample two dimensionally, as described in the paragraph beginning at column 14, line 60, and in the subsequent paragraphs (i.e., "a deflection element 102 for deflecting electron beams emitted from the electron beam source 101 in a two-dimensional fashion").

Further, Watanabe corrects the magnification error in accordance with the information provided by the height detection apparatus 200, whereas Applicants' claimed method aligns the optical axis with respect to the optical element.

Applicants' claims 1, 2, and 15 (directed to a charged particle beam alignment method) and claims 4 and 8 (directed to a charged particle beam apparatus) define an aligner for the alignment of optical axis with respect to an optical element (such as an objective lens or an astigmatism corrector), wherein an optical element condition is varied in each of two alignment conditions to obtain two image deviations, based on which alignment condition is calculated. See the attached reference sheet 2.

Watanabe, however, merely discloses that visibility Si and focus signal Ii are obtained for each sample height, and does not disclose the detection of the image deviation by varying the alignment condition, as claimed. And, Watanabe does not disclose the determination of the alignment condition with respect to the optical element, as claimed. Claim 24 (corresponding to original claim 3) defines a method that includes the same elements as are recited in claims 1 and 2, and is thus similarly allowable over Watanabe.

With respect to the rejection of claim 11, the Office Action relies upon the disclosure of Watanabe at column 24, lines 15-32. In column 24 Watanabe discloses that the detection image and the comparison image are aligned to the accuracy of one pixel or less, wherein the position of the comparison image is displaced such that the matching degree between the images becomes a maximum. Thus, what Watanabe suggests is merely that the positioning of the images (image data) is carried out based on the degree of matching.

In contrast, Applicants' claimed invention (claim 25, corresponding to original claim 11) defines an apparatus that calculates an alignment condition of the alignment deflector for axial alignment with respect to the optical element. Claim 25 defines, *inter alia,* a means for generating an alert when i) the deviation between images which results when an optical element condition is varied exceeds a predetermined range, or when ii)

there is no structural information on the images that is necessary for the detection of image deviation. The alert is given because in these cases i) and ii), it is likely that necessary information for calculating the alignment deflector condition cannot be obtained. Thus, claim 25 is allowable over Watanabe, since Watanabe fails to disclose either the alignment deflector for the axial alignment with respect to the optical element, or the means for making a decision based on the conditions i) and ii). Claim 26 (corresponding to original claim 12) defines an apparatus that includes further means for specifying the condition ii) of claim 25, and is thus similarly allowable over Watanabe.

Claims 27 and 28 (corresponding to original claims 13 and 14, respectively) also distinguish over Watanabe. Claims 27 and 28 each define a charged particle beam apparatus having means for registering a sample image when i) the deviation between images which results when an optical element condition is varied exceeds a predetermined range, or when ii) there is no structural information on the images that is necessary for the detection of image deviation. The sample image is registered so that it can be confirmed later whether measurements are reliable or not, because in these cases i) and ii), it is likely that necessary information for calculating the alignment deflector condition cannot be obtained, and so measurements cannot be made based on accurate optical axial alignment.

With respect to claim 16, the Office Action asserts (page 10) that Watanabe discloses that "a plurality of calculation methods . . . are utilized by entirety unit 120 to control beam deflection." While Watanabe may mention height calculation, image matching degree calculation, image correction calculation, and image difference calculation as examples of the calculation method, none of these calculations is for obtaining the amount of deflection of an alignment deflector, as claimed. Thus, Watanabe fails to disclose Applicants' claimed "calculation means for calculating a deflection amount of said alignment deflector, wherein a plurality of calculation methods for calculating said deflection amount are memorized in said calculation means" (claim 16).

Claim 29 (corresponding to original claim 20) defines an apparatus that includes means for calculating a deflection amount of the alignment deflector based on information about the image. When the deflection amount of the alignment deflector exceeds a predetermined value, the calculation of a deflection amount is repeated based on the image formed by using the charged particle beam that has been properly aligned to some extent by the initial alignment. This repetition is carried out to improve the calibration accuracy because the image used for the calculation of the deflection amount has been obtained when the optical axis was greatly displaced with respect to the optical element. The apparatus defined by Applicants' claim 29 distinguishes over Watanabe, because

Watanabe fails to disclose such an alignment retry based on the magnitude of the deflection amount.

With respect to claim 21, the Office Action asserts that Watanabe discloses that the height detection apparatus measures the displacement of the slit image by using its center of gravity. However, Watanabe's slit image is the image of a slit that is detected via a multi-slit pattern when the sample surface is irradiated with light. Watanabe's image, therefore, is different from the image defined by Applicants' claim 30 (corresponding to original claim 21). In Applicants' apparatus, the image is obtained when the charged particle beam scans while changing an optical element condition in the charged particle optical system. The apparatus defined by Applicants' claim 30, therefore, also distinguishes over Watanabe.

Claim 22 defines an apparatus having a preferable order of adjustment of the optical system, in which i) an alignment deflector for an astigmatism corrector, ii) an astigmatism corrector, iii) an alignment deflector for an objective lens, and iv) an objective lens are arranged in that order following a charged particle source. Watanabe discloses neither the alignment deflector or the astigmatism corrector, nor the above-mentioned arrangement of structural elements for adjustment, as claimed.

Claim 23 defines an apparatus having a feature of displaying the image to be used for the calculation of the deflected amount of the alignment deflector for visual inspection. In the case of calculating the alignment deflected amount based on a plurality of images, as in the present invention, the reliability of the deflection amount calculation is adversely affected when the images include an inappropriate image (such as one blurred for some reason). By displaying the images to be used for the calculation, the operator can make a decision as to the reliability of the axial alignment process. Watanabe discloses neither the alignment deflector, nor the feature of displaying the images for the calculation of the deflection amount, as claimed.

For at least the above reasons, reconsideration and withdrawal of the rejection of claims 1-23 under § 102(b) are respectfully requested.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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